

# Prevalence and awareness of nutritional anemia among female medical students in Karad, Maharashtra, India: A cross-sectional study

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## ABSTRACT

**Introduction:** Anemia is a global public health problem affecting both developing and developed countries. According to the World Health Organization, the highest number of individuals affected by anemia is observed in nonpregnant women aged 15–49.99 years. Though nutritional anemia can affect any age group, female medical students form a vulnerable population due to their hectic schedules, erratic mealtimes, and long working hours while staying in hostel for majority of times. Therefore, this study is aimed at determining the prevalence and awareness of anemia among the apparently healthy female students studying at a health institute. **Methods:** A cross-sectional study is conducted among 300 female students studying at a health institute in western Maharashtra after their written informed consent. A structured questionnaire elicits their general information, the knowledge about signs and symptoms of anemia, and dietary habits. Basal metabolic index and hemoglobin using the spectroscopy method are estimated for each participant. **Results:** Anemia prevalence in our population is 86 (28.6%). Based upon the severity of anemia, about 54 (18%) has mild anemia and 32 (10.6%) has moderate anemia. No case of severe anemia is noted in our study sample. **Conclusion:** The findings of the study highlight that anemia can affect even medical female students who are a vulnerable group unexpectedly suffering from nutritional deficiencies. Thus, this study highlights the need for interventional programs at primary health-care systems and colleges for improvement in the nutritional status of anemic students to reduce its complications.

**Keywords:** Body mass index, hemoglobin, medical, nutritional anemia, students

## Introduction

Anemia is a global public health problem affecting 1.62 billion people globally, which corresponds to 24.8% of the population as per World Health Organization (WHO).<sup>[1,2]</sup> It is a significant burden on the social and economic development for both the developing and developed countries alike.<sup>[1]</sup>

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Anemia is defined as an abnormal reduction in the number of circulating red blood cells, the quantity of hemoglobin and the volume of packed red cells in a given unit of blood.<sup>[3]</sup> The etiology of anemia is the result of a wide variety of causes that can be isolated, but more often coexist. Iron deficiency has been the prominent cause for onset of anemia, whereas other causes identified include heavy blood loss as a result of menstruation, or parasite infections such as hookworms, schistosomiasis, and other infections like malaria, cancer, tuberculosis, and HIV. In addition, micronutrient deficiencies, including vitamins A and B12, foliate, riboflavin, and copper can increase the risk of anemia.<sup>[4]</sup>

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Medical female students form a vulnerable population in this regard especially with irregular stressful schedules and erratic mealtimes. Therefore, this study was aimed at determining the prevalence of anemia among the apparently healthy female students studying at a health institute.

## Materials and Methods

The study was conducted after obtaining due ethical clearance and permission from the higher University officials. The cross-sectional study was conducted on 300 nonpregnant, unmarried students by random sampling method studying at a health institute in western Maharashtra after their written informed consent. Students with bleeding disorders, a history of hematological disorders, and who had undergone major surgery in the recent past were excluded from the study.

### Data collection

#### Development of tool

Tool was divided into following two sections.

#### Section 1

A pretested self-administered structured questionnaire was developed to collect the background information of the study subjects including their age, dietary habits, frequency of taking junk food, monthly income, and history of any chronic disease or worm infestation, any irregularity in menstrual cycle, and duration of menstrual cycle.

#### Subjective parameters

Age was recorded from the birth-date recorded in the data documents. Standing height was recorded without shoes on a wall mounted measuring tape to the nearest of centimeters (<5 mm and >5 mm). Weight was recorded without shoes on a weighing machine with a least count of 500 g.

Basal metabolic index (BMI) was calculated by the formula:  $BMI = \text{weight (in kg)}/\text{height (m}^2\text{)}$ .

International obesity task force has proposed the standards for adult obesity in Asia and India, according to which a cutoff point of 18.5 kg/m<sup>2</sup> is used to define thinness or acute under nutrition while a BMI of 23 kg/m<sup>2</sup> indicates overweight and a BMI of over 25 kg/m<sup>2</sup> is referred to as obesity.

#### Section 2: Physiological parameter

Hemoglobin was measured using the spectroscopy method using the standard protocol. The measured values were tabulated and compared to the standard values of grading anemia according to WHO guidelines with <12 gram% of hemoglobin considered as anemic (WHO 1975) while values of hemoglobin of 10.0–11.9 gram%, 7.0–9.9 gram%, and <7 gram% were noted as Grade 1 (mild) anemia, Grade 2 (moderate) anemia, and Grade 3 (severe) anemia, respectively.

### Analysis of the data

The data analysis was done in accordance with the objectives of the study. Data were analyzed using descriptive and inferential statistics and SPSS version 15 was used for analysis of data.

## Results

Findings related to prevalence of anemia indicated that according to the WHO guidelines, in our study of 300 student subjects, 86 (28.6%) were suffering from anemia. Based upon the severity of anemia, about 54 (18%) had mild anemia, and 32 (10.6%) had moderate anemia. No case of severe anemia was noted in our study sample as indicated in Table 1.

Regarding the BMI, 51 (17%) were underweight, whereas 26 (8.7%) were overweight and 5 (1.7%) were obese. Normal range of BMI was documented in 218 (72.7%) of the study subjects [Table 2]. There was significant correlation seen between BMI and hemoglobin levels in our study as indicated in Table 3.

Regarding average duration of about 171 (57%) of the study population had an average of 5–7 days of monthly menstrual cycle while only 4 (1.3%) has it for an average of more than 7 days as demonstrated in Table 4.

A good awareness level was observed regarding knowledge that anemia is a health problem as 291 (97%) of the respondents said yes to the statement. The percentage of people who were willing to take iron tablets if prescribed for anemia was also good at 90% in the given study as indicated in Table 5.

**Table 1: Distribution of study sample according to grade of anemia**

Hemoglobin (g/dl)	Indicator	Frequency	Percentage
≥12	Nonanemic	214	71.3
10.0-11.9	Grade 1 (mild) anemia	54	18
7.0-9.9	Grade 2 (moderate) anemia	32	10.6
Less than 7	Grade 3 (severe) anemia	00	00

**Table 2: Prevalence of anemia among students belonging to different nutritional level (BMI)**

Anemia	Underweight	Normal	Overweight	Obese	Total
Present	43 (14.3%)	31 (10.3%)	12 (4%)	2 (0.67%)	86 (28.6%)
Absent	8 (2.67%)	187 (62.3%)	24 (8%)	3 (1%)	214 (71.3%)
Total	51 (17%)	218 (72.6%)	36 (12%)	5 (1.67%)	300 (100%)

**Table 3: Correlation between BMI and Hb in the study sample**

Correlation between BMI and Hb	Pearson correlation	P
	0.55	0.001

## Discussion

Anemia, which is the most prevalent nutritional problem worldwide, occurs more commonly in young children, pregnant women, and women of child bearing age. The prevalence of iron deficiency anemia, which is the commonest cause for anemia, is 52% in Indian women aged 15–49 years, as per WHO statistics.<sup>[5]</sup>

The primary aim of this study was to estimate the prevalence of anemia using hemoglobin levels in female students from a health institute with the purpose that this provides an opportunity, to intervene at a point in life, before the potential problems become serious later in life.

Though we did not encounter any cases of severe anemia in our study, 23.3% and 47.7% of moderate and mild anemia cases, respectively, in our study are worrisome findings. This population is ideally supposed to have a better awareness and access to anemia diagnosis and treatment compared to general population. These findings are similar to a study conducted by Pandey *et al.*, among the medical students, where they found that there was mild anemia among 20 students (20.83%) followed by moderate anemia among 9 students (9.37%) but there were no student having severe anemia.<sup>[6]</sup> The findings are also comparable to a study conducted by Chaudhary *et al.*, where out of 104 subjects,

72 subjects (69.2%) had mild anemia while 32 subjects (30.8%) had moderate anemia and none of their subjects had severe anemia.<sup>[7]</sup>

The prevalence of anemia varies greatly according to the host factors like age, gender, physiologic causes, pathologic causes, nutritional factors, and socioeconomic conditions. This study was done among unmarried college going girls from a health institute with good health facilities. The contributing factors could be stress of the professional course that demands long study hours, attending night postings, changes in the dietary habits in most of the students, as they enter university, and increased tendency to lose weight for zero size, combined with menstrual losses.<sup>[8]</sup>

We found significant correlation of anemia with BMI in our study. Different studies have, however, shown significant relation of underweight and anemia as Bano *et al.* found that majority (81.8%) of anemic students were undernourished as per their BMI, whereas Pandey *et al.* reported that the prevalence of anemia among underweight students was 60%, normal was 27.5%, and overweight was 12.5%.<sup>[6,9]</sup>

A nutritious breakfast that includes sugar, starch, protein, fat, fiber, vitamins, and minerals, especially iron and vitamin C, which is necessary to ensure the sustained release of energy. In our study, it was fortunate to note that 272 (90.7%) had breakfast regularly. This was similar to study conducted by Akhtar in Lahore where out of a total of 114 female students studied, 84 (73.3%) had a habit of daily breakfast. This was in contrast to study by Shill *et al.* in Bangladesh where skipping breakfast is a known practice among university students of due to late awakening, not being hungry in the morning, or dislike toward the food served.<sup>[10,11]</sup>

Lack of intake of fruits and vegetables in diet are also contributing factors for poor health status.<sup>[12]</sup> Stress of hostel and burden of medical study would also negatively affect their diet.<sup>[13]</sup>

Poor eating habits are a major public health concern among university students. Meal skipping, eating away from home, snacking, and fast food consumption predispose them to dietary deficiencies.<sup>[14]</sup> Students commonly choose fast food due to its flavor, aroma, and taste.<sup>[15]</sup> Students, who study medicine, also follow the same pattern, in spite of them having better knowledge about health and better access to health care facilities.<sup>[16]</sup>

In total, 52 (17.3%) of our study participants declined to consume green leafy vegetables for anemia prevention. A similar poor attitude toward healthy eating was observed by Hadaye *et al.* in their study at a tertiary care hospital of Mumbai city, India, where out of 280 students, only 70 (25%) consumed green leafy vegetables only once a week.<sup>[17]</sup>

In our study, 192 (64%) participants did not consume multivitamins. The medical student comes under the vulnerable group that suffer anemia because of their living in the hostel or

**Table 4: Distribution of study sample according to average duration of menstrual cycle**

Average duration of menstrual cycle	Frequency	Percent
2-4 days	125	41.7
5-7 days	171	57
More than 7 days	4	1.3
Total	300	100

**Table 5: Knowledge and attitude factors regarding anemia among the study population**

Questions	Yes		No	
	Frequency	Percent	Frequency	Percent
Do you think anemia is a health problem?	291	97	9	3
Do you have history of any chronic illness?	44	14.7	256	85.3
Would you seek medical attention if you suspect anemia?	270	90	30	10
Would you increase consumption of green leafy vegetables if prescribed for anemia?	248	82.7	52	17.3
Would you be willing to take iron tablets if prescribed for anemia?	270	90	30	10
Do you have breakfast regularly?	272	90.7	28	9.3
Do you have multivitamins regularly?	108	36	192	64

as day scholars away from parents and families, placing these individuals at greater risk of deficiencies.<sup>[6]</sup>

About 171 (57%) of the participants in this study had 5–7 days of menstrual cycle. Heavy menstrual blood loss is an important risk factor for anemia especially the iron deficiency anemia. The mean menstrual iron loss, averaged over the entire menstrual cycle of 28 days, is about 0.56 mg/day.<sup>[18]</sup>

Although the diagnosis of anemia is simple, it goes unnoticed for a prolonged duration due to its nonspecific clinical signs and lack of testing even among medical students. As anemia is associated with a low work capacity, as well as lasting effects on learning and cognitive function, attention, behavior and growth, identification of the disease, and contributing factors are a first step toward its management.<sup>[19]</sup>

Nutritional deficiencies leading to anemia could have detrimental effect on health on future doctors and health care providers of India. Moreover, with doctor patient ratio of 1:1700 in India, the issue becomes even more critical.<sup>[20]</sup>

Hence, more research is required in this regard including detailed studies for types of anemia, and longitudinal studies to assess year-wise anemia prevalence in the medical students. This can also be beneficial in designing the future interventional programs for the medical students, which will hopefully get translated into healthy doctors in the future.

## Conclusion

The findings of our study indicate anemia prevalence of 86 (28.6%) in the study population. Significantly anemia was prevalent in underweight, as well as overweight, and obese students. Thus, this study highlights that female medical students are a vulnerable population and there is an urgent need for interventional programs at colleges. The authors conducted lectures on etiology, clinical features, and preventive and treatment modalities of anemia including nutrition and good eating habits in the college for all the participants.

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## Conflicts of interest

There are no conflicts of interest.

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